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THE RAINFALL OF JUNE, 1903.

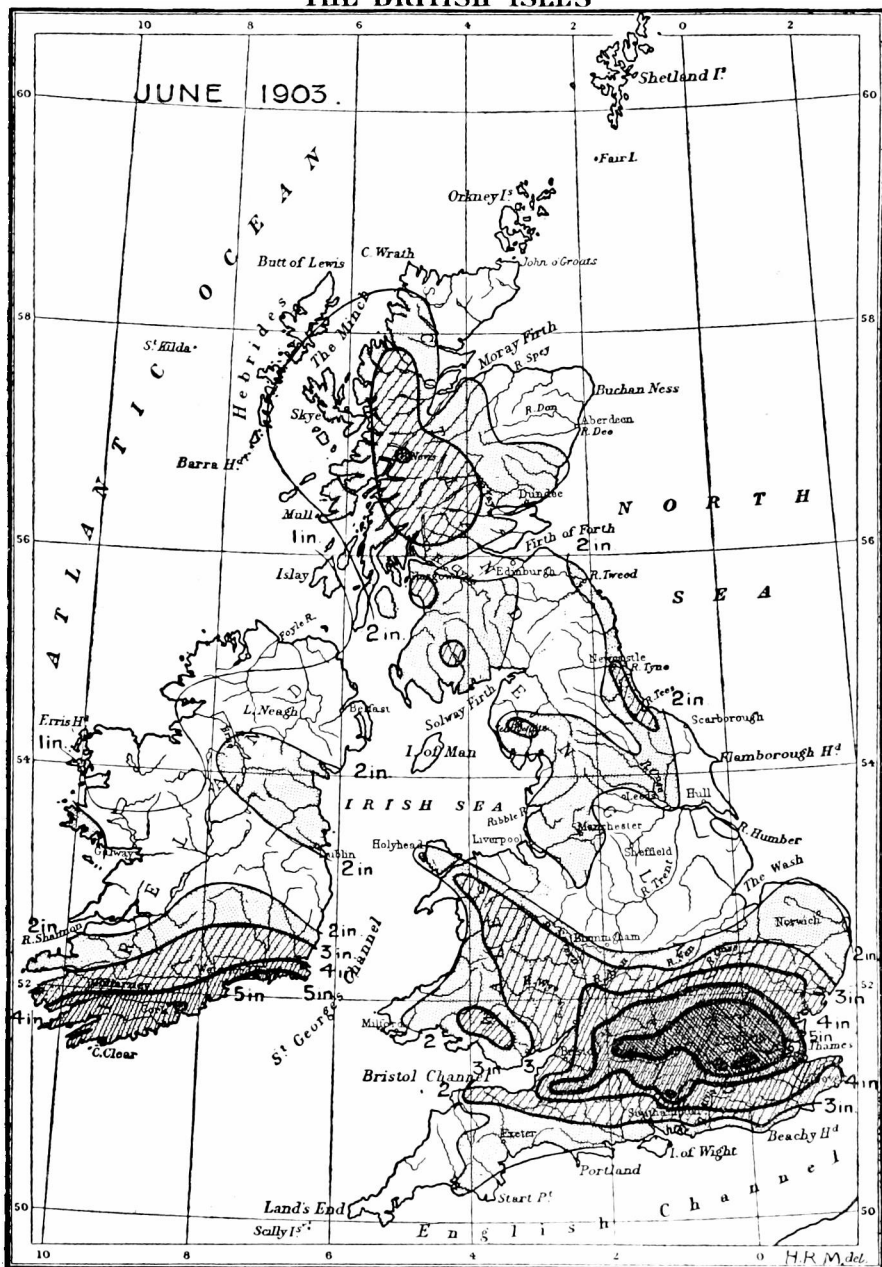
THE month of June, 1902, exhibited a peculiarity of rainfall, the wettest part of the British Isles having been the south of England and the driest part the north of Ireland and Scotland (see this Magazine for July, 1902, p. 88). The month of June, 1903, exhibits the same peculiarity in a more intense and, we believe, an unprecedented degree, and we therefore deal with the distribution in more detail on this occasion, and illustrate it by a map on a larger scale than that given last year.

To a certain extent the rainfall tends towards a more uniform distribution in June than in other months, for in the wet western and north-western districts it is usually the driest month of the year, while in the dry southern and south-eastern parts of the country the greater frequency of thunderstorms often makes it a wet month. The wetness of a wet June is usually due to torrential rain affecting small and scattered areas and falling only for a few hours; it is usually accompanied by great heat. Both in 1902 and 1903 the wetness of June in the south of England has been due to long-continued steady rain lasting for many hours at a time, not accompanied by thunder except on rare occasions, but associated with exceptionally low temperature. The rain was, in fact, rather of an autumnal than a midsummer type.

We have prepared the accompanying map from data supplied by more than 400 observers, to many of whom special requests were addressed so that the area of the heaviest fall could be determined as accurately as possible. We are particularly grateful to Mr. F. Campbell Bayard and Mr. W. Marriott for the number of records they supplied. Some parts of Scotland, Ireland and Mid-Wales, were sketched in from infrequent data; but the whole of the south of England was well represented, and so far as its scale admits the map may be accepted as substantially correct.

Where less than two inches of rain fell in the month the map is left unshaded, while lines are drawn for every inch of rainfall, the shading above two inches being made darker in proportion to the fall. It will be seen that the north and north-west of Ireland and some of the islands of the Outer Hebrides had less than one inch of rain, about one-third or one-quarter of the average amount, and a narrow belt from Stafford to Lincoln was equally dry. The north and east

THE BRITISH ISLES



THE RAINFALL OF JUNE, 1903.

of Scotland and the centre of the north of England, together with the greater part of Ireland, had less than two inches.

The Lake District contained a very small area over three inches, a larger area with a fall of equal amount occurred near the coast in the north-east of England, while a comparatively large region in the west of Scotland had a rainfall very slightly exceeding three inches, but in no place greater than the average fall for the month, and in very few approaching it. A fairly large area in the middle of Wales also slightly exceeded three inches, and probably falls of four inches or over occurred in some part of the Principality. In the south of Ireland the amount of rainfall increased towards the south coast, the whole of which had more than four inches, and in the south-east more than five inches of rain.

The most interesting distribution, however, is that over England. A broad dry belt in which the fall scarcely anywhere reached two inches (and nowhere reached the average for the month), stretched from North Wales and the Mersey to the Humber and the Wash, separating a slightly higher rainfall on the north from an excessively high rainfall on the south. The wet zone stretched from west to east across the country. Along the axis of it, from Swindon to South-end, for a distance of 110 miles, the rainfall exceeded 6 inches (or more than three times the average amount), the greatest breadth of the belt with a rainfall nowhere less than 6 inches was 40 miles between Hertford and Red Hill. This extremely heavy fall prevailed over the greater part of the valley of the Thames and Lea, and in the south, especially in the neighbourhood of Croydon, it exceeded 7 inches and in one case reached the unprecedented figure of 8·91 inches. The total area on which the fall exceeded 6 inches may be estimated at 2240 square miles, of which about 90 square miles had over 7 inches. Surrounding this very wet area was a belt from 5 to 20 miles wide, with over 5 inches of rain, covering 3300 square miles, and outside that a belt from 4 to 15 miles wide, in which the rainfall exceeded 4 inches, an area of 3700 square miles.

Assigning to each of these areas the average rainfall indicated by a large scale map, on which all the figures were plotted, we get the following table :—

	Area (sq. miles).	Rainfall (in.)	Volume of water (square mil. x in.)
More than 7 in.	90	7·3	657
Between 6 in. and 7 in.	2150	6·3	13545
Between 5 in. and 6 in.	3300	5·6	18480
Between 4 in. and 5 in.	3700	4·5	16650
Above 4 in.	9240		49332

This gives an average rainfall over the 9240 square miles of 5·3 inches. One inch of rain over one square mile of area is equal to about 64,660 tons of water, or 14,483,000 gallons. As the area of heaviest fall was central over the middle and lower Thames, and as the whole of the Upper Thames basin lay within the area on

which more than 4 inches of rain fell, it is, of course, understating the average rainfall of the Thames valley if we put it at 5·3 inches. It will be an understatement, we believe, to put it at 5·5 inches for the month of June, 1903; but it may be conveniently taken at that figure for the purpose of calculation. The total drainage areas of the Thames and Lea above Teddington and Feilde's Weir, respectively, is approximately 4200 square miles, so that for the month of June, or rather for the ten days between June 8th and 19th, during which all the rain fell, the amount of water deposited on the drainage area of the two rivers was 1494 million tons, or 334,560 million gallons.

Taking the mean rainfall over the county of London at 6·3 inches, which is a reasonable estimate, though probably too low, the amount of water which fell on the 117 square miles of the metropolitan county amounted to nearly 48 million tons, or 10,675 million gallons. At Camden Square the rain fell during 110 hours, and on the assumption that this rate held good for the whole county, the amount of water deposited in London during the period when it was falling, averaged 433,000 tons, or 97,000,000 gallons per hour.

The usual tables published in this number give the rainfall for June at about 150 stations, and we have not space to print all the additional records. The extremes, however, are so interesting that we give below a statement of the 30 highest and the 14 lowest falls that have been reported to us. It is enough to say that the former are all in a region where the June fall is normally about two inches, the latter are mainly in districts where the June fall usually considerably exceeds three inches.

Thirty Wettest Stations in June, 1903.

		in.
Carshalton Sewage Works	Surrey	8·91
Brimstone Barn, Croydon	„	8·10
Park Farm, Addington	„	8·04
Waddon New Road, Croydon	„	7·76
Ashburton Road, „	„	7·62
Park Hill Rise, „	„	7·51
Hayes	Kent	7·39
Pyrford Croft	Surrey	7·38
Duppas House, Croydon.....	„	7·20
Wallington, „	„	7·09
Beddington, „	„	7·03
Burgh Heath, Banstead	„	7·00
The Hemnalls, Epping	Essex	6·96
Avondale Road, Croydon	Surrey	6·95
Addington	„	6·92
Sanderstead	„	6·92
Bickley	Kent	6·92
D'Abernon Chase, Ashtead.....	Surrey	6·91
South Norwood.....	„	6·91
Lindisaye, Horsell	„	6·90
Worcester Park.....	„	6·84
Beckenham.....	Kent	6·84
Letcombe Regis.....	Berkshire	6·84

		in.
Broxbourne	<i>Hertfordshire</i>	6·84
Bromley	<i>Kent</i>	6·81
Belle Vue, Staines	<i>Middlesex</i>	6·81
Banstead	<i>Surrey</i>	6·77
Benhilton	"	6·76
Warlingham ..	"	6·76
Horsley Towers	"	6·76

Fourteen Driest Stations in June, 1903.

		in.
Markree Observatory, Collooney	<i>Sligo</i>	·70
Dunderave, Bushmills	<i>Antrim</i>	·72
St. Helen's, Westport	<i>Mayo</i>	·79
Murrisk Abbey, "	"	·83
The Heath House, Cheadle	<i>Staffordshire</i>	·85
Creggan Reservoir	<i>Londonderry</i>	·87
Bucknall, Horncastle	<i>Lincolnshire</i>	·88
Horn Head	<i>Donegal</i>	·89
Letterkenny	"	·90
Watten	<i>Caithness</i>	·91
Lincoln	<i>Lincolnshire</i>	·91
Duffield	<i>Derbyshire</i>	·93
Enniscoe	<i>Mayo</i>	·94
Callabus, Islay	<i>Argyll</i>	·94

So far we have spoken of the total rainfall, we now have to examine the way in which it was distributed throughout the month. For this purpose the dates of days with rain for 150 well-distributed stations were written out and compared. The smallest number of rainy days occurred in Norfolk, where two stations showed respectively five and six days ; the largest number occurred in parts of the east coast of Great Britain, 18 rainy days having been experienced at Cawdor in Nairnshire and 16 or 17 days in parts of the East Riding of Yorkshire, Forfarshire, Aberdeenshire, and also in Co. Donegal. The number of days bore no relation to the amount of fall. Over the whole country the average number of rainy days was 10·2, and in the area of heaviest fall the number of rainy days was almost without exception either 9 or 10. In that area also the total fall for the month occurred between the 8th and the 19th in two wet spells, one from the 8th to the 11th, the other from the 13th to the 19th ; but in the second spell either the 17th or the 18th was usually dry. The first rainy spell did not extend to the extreme east of England, thus accounting for the small number of rainy days in that locality. In the west of England the first rainy spell consisted of only two days, the 8th and 9th, and brought little rain. The latter part of the second rainy spell, about the 19th, was very wet, and a third rainy spell occurred between the 23rd and 25th. In the north of England, Scotland and Ireland, the rains of the month were more frequent but much less intense. The days were not so clearly grouped into spells as in the south and west, indeed only the third spell, which occurred in the last week of the month, was a well defined wet period.

London lay in the very centre of intensity of the mid-June deluge, and although the neighbourhood of Croydon had fully an inch more rain than the north of London, the Camden Square record represents very nearly the average amount for the lower Thames valley, and may thus be taken as typical of the whole of the very wet area. Rain to the depth of 6·43 in. fell on ten days, giving a fall of ·64 in. per rainy day, whereas the average fall (for 45 years) per rainy day in June is only ·19 in. On three of the ten rainfall days the fall exceeded one inch, and on two other days it exceeded half-an-inch. The record of the self-recording gauge shows that there were only eleven showers during the ten rainy days, the word *shower* being used to denote a period of continuous rain. Of these, three showers had a duration of only half-an-hour each, and one lasted for an hour and a quarter; the other seven each exceeded four hours. The following is an exact statement of the duration, amount and average intensity of the rain at Camden Square. The dates refer to the civil day.

Shower.	Rain commenced.	Rain ceased.	Duration of shower.	Amount of rain.	Intensity per hour.
i.	June 9th, 2.45 a.m.	7.30 a.m.	4 h. 45 m.	·51 in.	·107 in.
ii.	„ 10th, 2.15 a.m.	7.30 a.m.	5 h. 15 m.	·43 „	·082 „
iii.	„ 10th, 10.45 a.m.	6.15 p.m.	7 h. 30 m.	·09 „	·012 „
iv.	„ 10th, 11.15 p.m.	3.30 a.m. on 11th	4 h. 15 m.	·08 „	·019 „
v.	„ 11th, 1.15 p.m.	8.15 p.m.	7 h. 0 m.	·19 „	·027 „
vi.	„ 13th, 1.0 p.m.	11.30 p.m. on 15th	58 h. 30 m.	3·44 „	·059 „
vii.	„ 16th, 5.15 p.m.	5.45 p.m.	0 h. 30 m.	·21 „	·420 „
viii.	„ 16th, 7.45 p.m.	8.15 p.m.	0 h. 30 m.	·17 „	·340 „
ix.	„ 17th, 5.15 a.m.	5.45 a.m.	0 h. 30 m.	·02 „	·040 „
x.	„ 17th, 5.15 p.m.	6.30 p.m.	1 h. 15 m.	·15 „	·120 „
xi.	„ 19th, 9.15 a.m.	5.15 a.m. on 20th	20 h. 0 m.	1·14 „	·057 „
			110 h. 0 m.	6·43 in.	·058 in.

The only really heavy rain shown in the table is that which fell in the two short showers on the 16th, although portions of the longer showers showed individual half-hours of equal intensity. But attention is arrested by the extraordinary duration of steady uninterrupted rain from 1.0 p.m. on Saturday, the 13th, all that day, all Sunday, and all Monday until half-an-hour before midnight, when it stopped. These 58½ hours contributed more than half the month's fall; but it must be remembered that in the only wetter June at Camden Square of which records exist 3·28 in. fell in 56 minutes, from 1.32 p.m. to 2.12 p.m. and from 2.46 p.m. to 3.2 p.m., during a terrific thunderstorm on the 23rd of June, 1878. It was only in the shorter showers and once or twice for a short time during the longer falls that anything approaching the typical summer "thunder plump" was observed, and electrical disturbances were recorded from comparatively few places during the month.

The problem which this remarkable distribution of rain suggests to the meteorologist is a very puzzling one. It is to find the reason for a great wet area developing itself symmetrically along the valley of the lower Thames. The fact that the amount of rain bears little

relation to the configuration of the ground, and that where any relation is traceable it suggests a lower fall on the higher land, may be accepted as proof that it is the distribution of pressure in the air which must provide an explanation. The daily isobaric charts of the Weather Reports show that there was a distinct sympathy between rain and barometric pressure. From June 1st to 7th an anticyclone lay over the British Isles, the wind was steadily from north and north-east, and the weather generally dry. On the night of the 8th a low pressure area moved northward from France and continued over the south of England for four days, during which the first wet spell in the south took place. On the 12th the Atlantic anticyclone spread over the British Isles from the west bringing a dry day; on the 13th the pressure fell in the south, but again rose on the 18th, when a small low pressure area appeared over Scotland and inverted the gradient. On the 19th a well marked depression occupied the English Channel, and the rainfall over the extreme south of England was general and heavy while the north was dry. Next day the Atlantic anticyclone reasserted itself from the west and a period of absolute drought commenced in the south, which lasted at Camden Square unbroken for twenty-two days, a duration which has only been exceeded on eight occasions in the last forty-five years. Meanwhile the pressure in the north gave way about the 24th, and was relatively low until the end of the month, coinciding with the third wet spell, which did not extend to southern stations except in the west.

The difficulty is of course not removed, but merely shifted a step backward, by tracing the fluctuations of rainfall to variations in pressure, and there remains a reason to seek for the prolonged and steady rain which accompanied comparatively slight diminutions of pressure with very moderate gradients and little wind.

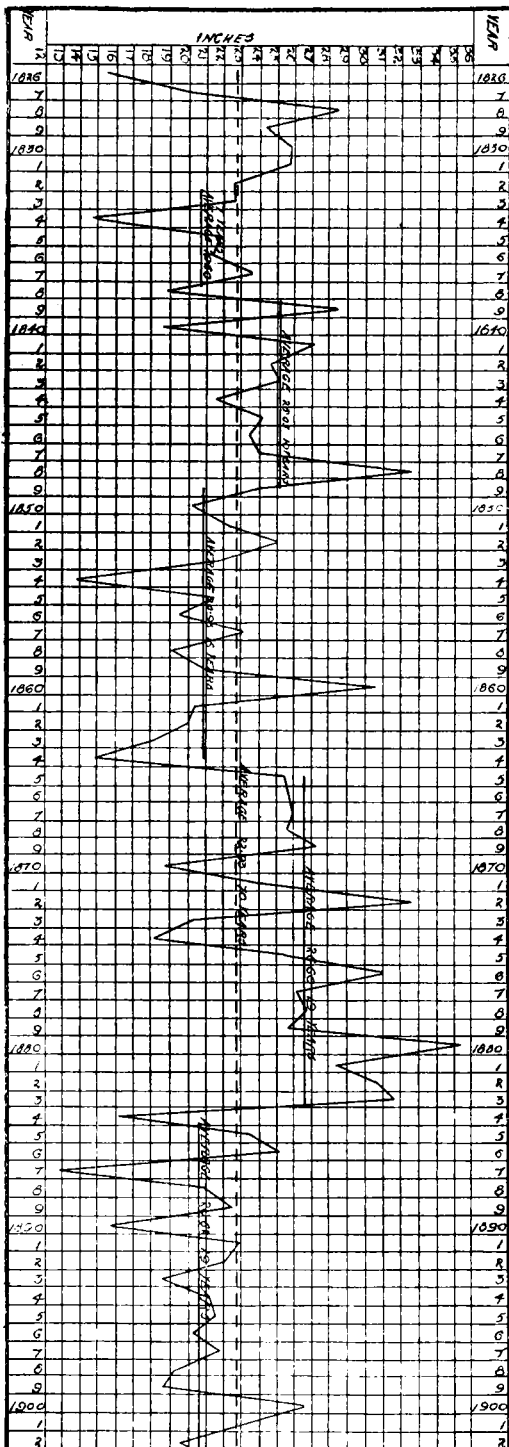
If space were available we should gladly print a selection of the numerous interesting letters we have received on the June rains, but we must ask the indulgence of our correspondents in this matter. For the same reason we must withhold a description of the floods in the Thames valley and in the rivers radiating from its southern watershed, for a long list of damage and loss would be necessary to do justice to the consequences of the ten days' deluge in the south, and—though in a less degree—to the troubles caused by drought in the north.

Correspondence.

RAINFALL IN THE LINCOLNSHIRE FENS, FROM RECORDS KEPT AT BOSTON.

To the Editor of Symons's Meteorological Magazine.

IN a paper on the "Shortage of Water," reported in your Magazine for April last, Dr. H. R. Mill pointed out that the rainfall statistics did not bear out the theory of a secular diminution of rainfall in the British Isles, but that the deficiency in the central parts of England had been very great, reaching 16 or 17 per cent. for the ten years 1890-99.



Bearing on this the accompanying statistics and diagram of rainfall recorded by me at Boston, the centre of the Lincolnshire Fen district, may be of interest.

With the year ending December, 1902, there were completed two cycles of 19 years, one being a wet and the other a dry period.

For the 19 years 1865-1883 the average annual rainfall amounted to 26.60 inches.

For the 19 years 1884-1902 the average was 20.62 inches.

The mean annual rainfall of the 70 years 1830-1899 was 22.93 inches.

The surplus above this average for the wet period 1865-1883 was 69.73 inches, and the deficiency for the dry period 1884-1902 was 43.94 inches.

During the first period there were 3 years when the average was not reached; and during the second period 3 years when it was exceeded.

The greatest annual rainfall during these two cycles was 35.53 inches and the least 12.94 inches.

The accompanying diagram shows the periods of wet and dry years during the last 70 years.

W. H. WHEELER,
M. Inst. C. E.
Boston, Lincolnshire,
April 24th, 1903.

CLOUD ESTIMATION.

To the Editor of Symons's Meteorological Magazine.

THE practice of estimating the amount of cloud on the scale of 0 to 10 may have its imperfections from the circumstance that at any given place of observation the portion of sky at lower altitudes has not the same relation to the place itself as the portion overhead. In our country, and in others also, the tendency of the sky is usually to a cloudy or nearly cloudy state, or to a clear or nearly clear state, represented in the former case by estimations of say from 8 to 10, and in the latter case by estimations of say from 0 to 3, in both of which extremes the estimations are probably not much affected by the cause mentioned, which perhaps applies more to the transition state, as represented by the estimations 4 to 7, in which the cloud may be so situated as to refer more to the surrounding neighbourhood than to the place of observation. This transition state is, however, the exceptional condition. Lately I was induced to examine how far or to what extent it is really exceptional. For this purpose I selected at random from the Greenwich Observations for 1843 eight periods of five consecutive days each, two in each for the months of March, June, September and December, and as the observations were made every two hours, their number was in all 480. The results are as follows :—

	Group I. (0-3)	II. (4-7)	III. (8-10)	Mean Amount of Cloud.
Number of Observations	144	49	287	
Percentage.....	30	10	60	6.6

Thus, as was expected, the percentage of observations falling in Group No. II. is small ; only 10 per cent. of the whole.

I further discussed the observations at two places very different in position—Hawes and Strathfield Turgiss—employing the daily records at these places at 9 a.m. and 9 p.m. throughout the years 1875 to 1877, as given in Volumes III. and IV. of the *Quarterly Journal of the Royal Meteorological Society*. The number of observations in each of the years 1875 and 1877 was 730, and in 1876 was 732 ; in all, 2192 :—

	Group I. (0-3)	II. (4-7)	III. (8-10)	Mean Amount of Cloud.
Hawes—				
Number of Observations ...	430	242	1520	
Percentage	20	11	69	7.6
Strathfield Turgiss—				
Number of Observations ...	673	260	1259	
Percentage	31	12	57	6.4

The mean cloud at Strathfield Turgiss, 6.4, being much less than at Hawes, 7.6, the percentage in Group I. at Strathfield Turgiss is correspondingly greater, and in Group III. correspondingly less. But the percentages in Group II. are again small and nearly similar : 12 at Strathfield Turgiss and 11 at Hawes ; at Greenwich it was 10.

It seemed interesting to examine this point further. I therefore separated the observations of the 36 months at each place into three

divisions according to magnitude of the monthly amount of cloud. The results for the two places are given together, adding also that for Greenwich, the number of observations being here omitted and percentage only given :—

	Group I. (0-3)	II. (4-7)	III. (8-10)	Mean Amount of Cloud.
Strathfield Turgiss	46	11	43	5·0
Hawes	31	14	55	6·3
Strathfield Turgiss	29	14	57	6·5
Greenwich.....	30	10	60	6·6
Hawes	19	10	71	7·7
Strathfield Turgiss	17	10	73	7·8
Hawes	9	9	82	8·7

Thus whilst the percentage of 46 in Group I., with mean cloud 5·0, becomes reduced to 9 with mean cloud 8·7, the percentage of 43 in Group III. is increased to 82. But the percentages in Group II. vary only from 9 to 14. If the sky at any place were always clear, the percentage in Group I. would become 100, with nothing in Groups II. and III. ; if always cloudy, the percentage in Group III. would become 100, with nothing in Groups I. and II. But in the range of ordinary observations it would appear that increased percentage in Group I. is accompanied by decreased percentage in Group III., with little change in Group II.

WILLIAM ELLIS.

June, 1903.

GRASS AND SHADE MINIMA ON A HILL AND IN A VALLEY.

To the Editor of Symons's Meteorological Magazine.

I HAVE for some years noticed that the difference between the grass and shade minima is much greater in a valley than on a hill-top. The following comparison well illustrates my point.

At Beddington,* 120 ft. above sea, on Wandle Brook.				On Top of Wimbledon Hill,† about 270 ft. above sea.			
Shade Min.	Grass Min.	Diff.		Shade Min.	Grass Min.	Diff.	
April 13.....	30	21	9	...	32	28	4
„ 14.....	28	20	8	...	31	27	4
„ 15.....	37	28	9	...	38	35	3
„ 16.....	25	16·9	8·1	...	28	23	5
„ 17.....	25	17	8	...	29	26	3
„ 18.....	26	17·6	8·4	...	29	26	3
„ 19.....	25	19	6	...	30	26	4
„ 20.....	26·8	20·2	6·6	...	31	27	4
„ 21.....	34·9	29·2	5·7	...	39	35	4
„ 22.....	35	32	3	...	36	33	3
„ 23.....	26·7	20	6·7	...	31	27	4
„ 24.....	34	29·8	4·2	...	35	32	3
„ 25.....	25	16·7	8·3	...	30	24	6

* A difference of 12°—15° has sometimes been noted here. Average difference about 7°. Soil, gravel on chalk.

† An average difference of about 4°. Soil, clay.

STANLEY SINGLE

Park View, Wimbledon Park.

ROYAL METEOROLOGICAL SOCIETY.

THE concluding meeting of the present session was held on Wednesday afternoon, June 17th, at the Society's Rooms, 70, Victoria Street, Westminster, Capt. D. Wilson-Barker, F.R.S.E., President, in the chair.

Capt. C. Barron, Mr. G. Burt, Assoc. Inst. C.E., Mr. R. A. Coates, Mr. J. W. Gallagher, and Mr. A. Krawehl, were elected Fellows.

Dr. W. N. Shaw, F.R.S., read a paper on "The Meteorological Aspects of the Storm of February 26-27, 1903," in the preparation of which he had been assisted by Mr. F. J. Brodie and Mr. R. C. K. Lempfert. Between sunset on the 26th and noon on the 27th of February the British Isles were visited by a storm of unusual severity. Its most impressive characteristic was the amount of damage done to trees and buildings by gales from the south or south-west, particularly in the neighbourhood of Dublin, where very large numbers of trees were uprooted, and in Lancashire. Gales or strong winds were also experienced in many other parts of the British Isles. [See *Symons's Met. Mag.*, March and April, 1903].

After exhibiting some lantern slides showing the path of the barometric minimum and the area over which the destruction extended, Dr. Shaw proceeded to put forward some general conclusions about barometric depressions and storms, dealing more especially with the distribution of winds and the velocity of travel. He said:—

"There is possibly some misapprehension as to what motion of air may be expected to take place in a travelling storm of normal and permanent type. I will therefore devote a few lines to the consideration of that question. The accepted representation of the instantaneous motion of air in the neighbourhood of a low-pressure centre is a combination of rotation and radial motion represented by spirals with a certain incurvature. The maps suggest that the air approaches the centre by essentially similar paths from all sides. This suggestion appears to me to be apt to lead to very serious misapprehension. The apparent spiral motion is a merely instantaneous representation of the state of motion of a number of bodies. The actual motion of the air in a travelling storm is not a symmetrical spiral motion of air masses towards a centre, but a complicated kind of dance figure, in which the dancers group themselves at any instant in such a way that they can be sorted into spirals; but the path of any individual dancer may, and generally does, make no real approach to the spiral form. The spiral motion only becomes complete if the storm centre becomes stationary, and the conventional diagram represents the true paths in that case; but when the incurvature is small and the velocity of travel great, the general resemblance to symmetrical spiral motion is lost. To simplify the preliminary consideration of the question on this occasion, I propose to neglect the incurvature and regard the instantaneous motion of the travelling storm as purely rotational. I wish to consider the actual motion of the component air under the circumstances indicated—in other words, the actual geographical path of a balloon floating in the air within the influence of the cyclonic disturbance. For ease of distinction I shall call the actual path of the air a 'trajectory,' reserving the use of the word path for the motion of

the storm centre. If the centre of the storm were stationary the balloon would be carried round in a circle, but if the storm centre moves the trajectory is not a circle but something entirely different.

"I suppose, further, as a special case, that the velocity of the wind is uniform over the area covered by the circular storm, and that the velocity of travel of the storm centre happens to be the same as the velocity of the wind. The trajectories will be of different shape according to the original positions of the points under consideration with regard to the centre and its path. A point in front of the approaching centre will start at right angles to the path, but will be overtaken by the advancing storm and have its direction of motion reversed before it has made a half circle, and in the rear of the storm it will find itself in the region of nearly parallel isobars and travel away from the line of the path. Its trajectory will be a curious hook-shaped curve. A point behind the centre will get into the region of the isobars approaching more and more nearly to parallel straight lines inclined to the direction of motion of the storm. Its trajectory will not differ much from a straight line inclined to the path. A point in the transverse line through the centre on the left of the path will gradually approach and cross the path in the rear and come into the concluding condition of the previous cases, while a corresponding point on the right of the centre will not have its direction of motion affected but will travel along always keeping the storm centre on its left. Its trajectory will be a straight line parallel to the path. No point moves in a circle or in anything approaching to it. The apparent simplicity of motion as represented on an isobaric map becomes therefore very misleading when we deal with the actual motion of air. The trajectories in any real case depend upon the velocity of the centre and the incurvature as well as the original position of the points, and hence they are a series of exceedingly complicated lines always combining to show a comparatively simple and symmetrical arrangement of velocities at any instant.

"For any particular case, assuming a certain distribution of winds and a velocity of travel, it is easy to construct a diagram showing the trajectories for a series of particles which at any particular instant take their places on a circular isobar. Such trajectories are of course, to a certain extent, hypothetical, but at least they approximate to the motion of air in a real cyclonic depression. We may distinguish two extreme types—first, Type A, the stationary storm with symmetrical incurvature, drawing its air equally from all sides; and secondly, Type B, the storm made up of winds of uniform velocity but varying direction which travels with the same velocity as one of its component winds."

Dr. Shaw was of opinion that the storm of February 26th-27th must be classed as belonging to the Type B.

A long and interesting discussion followed the reading of this paper, in which the President, Dr. A. Buchan, Mr. R. T. Omond, Col. H. E. Rawson, Mr. W. Ellis, Mr. F. J. Brodie, Mr. W. H. Dines, Dr. H. R. Mill, Mr. C. Harding, Capt. A. Carpenter, and Mr. W. Marriott took part, and Dr. W. N. Shaw replied.

The other paper communicated to the meeting was "The Dines-Baxendell Anemograph and the Dial-pattern Non-oscillating Pressure-Plate Anemometer," by Mr. J. Baxendell, F.R.Met.Soc. The Dines

Pressure-Tube Anemometer is now the accepted standard instrument for recording wind movement, but it does not record the direction of the wind. Mr. Baxendell has endeavoured to overcome this drawback, and in this paper he gave a description of the combined velocity and direction anemometer which he has designed for the Fernley Observatory at Southport. In addition, he has designed a non-oscillating pressure-plate for showing on a dial the maximum pressure of the wind. By using a combined "head" or vane for the Dines anemometer Mr. Baxendell has been able to arrange for the new instrument to record—(1) the velocity, (2) the direction, and (3) the maximum pressure of the wind.

THE SIX MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—June, 1903.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	+7.22	175	Arneliffe ...+	11.93	145	Braemar	+8.95	163
Tenterden	+2.74	125	Hull	+1.66	116	Aberdeen	+2.53	119
Hartley Wintney	+7.78	173	Newcastle.....	+1.41	113	Cawdor	+4.77	139
Hitchin	+8.49	188	Seathwaite +	19.91	134	Glencarron +	14.05	135
Winslow	+6.90	170	Cardiff	+5.47	134	Dunrobin	+1.78	113
Westley	+1.64	116	Haverfordwest	+6.31	136	Darrynane ...	+3.50	116
Brundall	+ .16	102	Gogerddan ...	+4.49	125	Waterford ...	+6.91	141
Alderbury	+6.18	153	Llandudno ...	+4.27	136	Broadford	+5.31	137
Ashburton	+5.90	127	Dumfries ...+	10.29	154	Carlow	+7.20	149
Polapit Tamar ...	+5.30	135	Lilliesleaf	+6.65	152	Dublin	+3.34	129
Stroud	+7.72	167	Colmonell	+3.65	119	Mullingar	+5.78	136
Woolstaston	+6.52	152	Glasgow ...+	13.63	188	Ballinasloe ...	+5.33	134
Boston	+2.75	132	Inveraray ...+	10.70	134	Clifden ..	+2.29	107
Hesley Hall	+1.62	118	Islay	+4.57	124	Crossmolina ...	+5.91	126
Derby	+2.97	130	Mull	+6.23	126	Seaforde	+5.15	132
Bolton	+2.77	117	Loch Leven +	11.19	173	Londonderry..	+1.46	108
Wetherby	+5.97	158	Dundee	+2.23	119	Omagh	+7.53	145

The rainfall of the first six months of 1903 is above the average in all parts of the British Isles, and almost everywhere to a very substantial extent. Two extensive areas are particularly worthy of notice: the larger occupies the centre and south of Scotland and the north of England; the smaller occupies the central part of the south of England. In both the excess exceeds 50 per cent. of the average fall, and in both the excesses have the same maximum, both Hitchin and Glasgow having an excess of 88 per cent. The abnormal wetness of the winter months accounts for the condition of the northern area, that of the southern area is due mainly to the unprecedented character of June. Coast stations, both east and west, show the smallest excess of rainfall above the average.

REVIEWS.

The Cloud World, its features and significance, being a popular account of forms and phenomena, with an extended Glossary. By SAMUEL BARBER. London: Elliot Stock, 1903. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. xii. + 140. Illustrations.

THE author deals with clouds much in the same way as the field-naturalist deals with plants and animals. He describes their forms and what we may call their habits, dwelling upon the value of these characteristics as prognostics of coming weather. The scientific student of clouds or of air-movements, though he cannot fail to be interested in the observations which are detailed, will not be greatly helped, for the book was not written for him. The observer who loves observing for its own sake will find much to stimulate his interest in a fascinating avocation.

We cordially commend Mr. Barber's observations of the behaviour of clouds in exceptional circumstances to the attention of meteorologists. It would be well for the general reader to consult recent books on Meteorology to compare the impressions likely to be made by the portions of the text which border on theory with the views of other authors.

The pictures of clouds, most of them reproduced from *Knowledge* and many from the skilled camera of Captain Wilson-Barker, are a most attractive feature of the book.

U.S. Department of Agriculture. Report of the Chief of the Weather Bureau. 1900-1901. Size (vol. i.) 12×9 . Pp. 318. Washington: 1901.

Ditto. 1901-02. Size 12×9 . Pp. xxvi. + 342. Washington: 1902.

IN these reports only a few pages are devoted to the administration of the meteorological system; the bulk of the work is a discussion of the climatology of the United States for the year in question, mainly in the form of tables supplemented by explanatory statements.

With regard to the administration of the Weather Bureau, special attention is called to the efforts made to improve forecasts, and to secure the distribution of forecasts as widely and expeditiously as possible. Since the beginning of 1901 a new system of forecasts of Atlantic weather has been in use, whereby steamers leaving Europe are warned of the weather they are likely to meet in mid-Atlantic, and considerable success is claimed. A special caution is given to farmers who might be inclined to waste money by bombarding the sky in the hope of dissipating hail clouds; but, on the other hand, instances are cited in which damage from frost has been avoided by the timely use of smoke-producing combustibles in the fields on nights when a freezing temperature was predicted.

BOOKS RECEIVED.

- The Meteorology of Edinburgh. By R. C. Mossman. [Trans. Roy. Soc. Edin., Vol. XL., Part III.] Edinburgh, 1903. Size $12 \times 9\frac{1}{2}$. Pp 41, one plate.
- Survey Atlas of England and Wales. Part II. By J. G. Bartholomew. Edinburgh, 1903. Size $18\frac{1}{2} \times 12\frac{1}{2}$. Five maps.
- On the Similarity of the Short-period Pressure Variation over Large Areas. By Sir Norman Lockyer and W. J. S. Lockyer. [From Proc. Roy. Soc., Vol. 71.] Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 2 and one plate.
- Essai de Chronologie des Variations Glaciaires. Par M. C. Rabot. [Ex. du Bulletin de géographie historique et descriptive, No. 2.] Paris, 1902. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 47.
- Researches with the Heliometer. Determination of the Parallax of the Ten First Magnitude Stars in the Northern Hemisphere. By W. L. Elkin. [Trans. Astronomical Obsy. of Yale Univ.] Size $12 \times 9\frac{1}{2}$. Pp. 72.
- Meteorologisch Jaarboek voor 1900 & 1902. Utrecht, 1902. Size $12\frac{1}{2} \times 10$. Pp. xxxvi + 262 and xxv + 242.
- Meteorologiska Jakttagelser i Sverige. Vol. 39, 1897; 'vol. 40, 1898 and vol. 41, 1899. Stockholm, 1902. Size 12×10 . Pp. viii + 157 and x + 155.

METEOROLOGICAL NEWS AND NOTES.

THE INTERNATIONAL KITE COMPETITION, held on the Sussex Downs, on June 25th, under the auspices of the Aëronautical Society of Great Britain, took place in fine weather but with a wind too light to enable the kites to rise 3000 feet, the minimum height for which the medal could be awarded. The kites, which were all worked by hand gear, were six in number. Each was loaded with a weight of 2 lbs. to represent a meteorograph and the greatest heights attained, as calculated from trigonometrical observations, were for Mr. Brogden's Burmese kite, 1816 feet; Mr. L. Cody's bird-shaped kite, 1476 feet; Mr S. F. Cody's similar machine, 1407 feet and Mr. S. H. R. Salmon's rhomboidal kite, 1250 feet.

WEATHER FORECASTS ARE UNNECESSARY in the opinion of a daily paper, published in a sea-side resort, which observes—whether in fun or in earnest we cannot say—

“For the pleasure-seeker, who can provide himself with a waterproof coat and umbrella, these reports are superfluous, and may be detrimental. The dwellers in our rough sea-girt island should never be influenced by considerations of weather. Townspeople when they want fresh air should take it without any attention to warnings. If it is mixed with *more hydrogen* than they desire they should suffer it patiently. It will be a bad day for England when a man or woman hesitates about going to the sea-side on account of the weather.”

Some sea-side places seem, from the reference to hydrogen, to possess an explosive atmosphere.

THE THAMES FLOODS of last month caused a riverside resident to complain in the newspapers that he had taken his house because the river was at the bottom of his garden, but now he found that his garden was at the bottom of the river.

RAINFALL AND TEMPERATURE, JUNE, 1903.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1890-9.	Greatest Fall in 24 hours.		Days on which "01 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
		inches.	inches.	in.								
I.	London (Camden Square) ...	6.43	+ 4.53	1.48	14	10	85.9	28	39.7	13	0	0
II.	Tenterden	3.56	+ 1.37	.79	10	10	83.5	28	37.5	13	0	1
„	Hartley Wintney	5.55	+ 3.60	1.02	15	9	83.0	28 ^b	36.0	22	1	0
III.	Hitchin	6.40	+ 4.62	1.75	14	8	84.0	29	38.0	14	0	...
„	Winslow (Addington)	5.17	+ 3.32	1.60	14	10	83.0	27	34.0	21	0	1
IV.	Bury St. Edmunds (Westley)	3.11	+ 1.07	.75	13	6	86.0	28	36.0	13	0	...
„	Norwich (Brundall)	2.45	+ .43	.68	15	10	86.0	28	34.8	13	0	1
V.	Winterborne Steepleton	1.75	...	.58	19	11	77.6	1	33.5	22	0	2
„	Torquay	1.88	...	.54	19	14	76.2	1	43.5	22	0	0
„	Polapit Tamar [Launceston]..	1.80	— .59	.68	9	11	73.1	27	36.8	22	0	0
VI.	Stroud (Upfield)	4.12	+ 2.12	1.35	14	13	83.0	27	42.0	20	0	...
„	Churchstretton (Woolstaston)	3.16	+ 1.02	.96	14 ^a	13	75.5	27	37.0	14 ^a	0	...
„	Worcester (Diglis Lock)	2.90	+ 1.28	.83	10	15	...	...	...	...	...	...
VII.	Boston	1.59	— .09	.50	13	8	85.0	27	37.0	21	0	...
„	Hesley Hall [Tickhill].....	1.42	— .25	.93	13	9	83.0	27	35.0	21	0	...
„	Derby (Midland Railway).....	1.26	— .79	.45	13	8	81.0	27	37.0	20	0	...
VIII.	Bolton (The Park)	2.34	— 1.26	.65	26	9	71.5	27	35.1	21	0	1
IX.	Wetherby (Ribston Hall) ...	2.48	+ .39	.78	13	10	...	...	...	...	...	...
„	Arncliffe Vicarage.....	2.34	— 1.39	.83	26	11	...	...	...	...	...	...
„	Hull (Pearson Park)	1.74	— .23	.99	13	8	81.0	28	39.0	21	0	...
X.	Newcastle (Town Moor)	3.06	+ 1.18	.95	15	10	...	...	...	...	...	...
„	Borrowdale (Seathwaite).....	3.96	— 3.14	1.70	26	12	73.5	6	31.3	20	1	...
XI.	Cardiff (Ely).....	2.09	— .24	.62	14	12	...	...	...	...	...	...
„	Haverfordwest	2.13	— .20	.77	25	10	68.7	8, 27	35.9	21	0	4
„	Aberystwith (Gogerddan) ...	2.26	— .38	1.05	10	8	77.0	27	28.0	19	3	...
„	Llandudno	1.11	— .86	.38	15	10	70.0	23 ^c	42.5	21	0	...
XII.	Cargen [Dumfries]	1.84	— .88	.43	27	9	74.0	4	35.0	12	0	...
XIII.	Edinburgh (Royal Observatory)	1.09	...	.37	4	11	74.2	4	39.7	18	0	1
XIV.	Colmonell	1.99	— .68	.59	27	9	77.0	8	34.0	20	0	...
XV.	Tighnabruach	2.60	...	.93	30	11	71.0	7, 10	38.0	19	0	...
„	Mull (Quinish)	2.34	— 1.09	.69	30	10	...	...	...	...	...	...
XVI.	Loch Leven Sluices	2.87	+ .49	1.23	28	9	...	...	...	...	...	...
XVII.	Dundee (Eastern Necropolis)	2.20	+ .37	.55	27	17	79.0	4	36.3	14	0	...
„	Braemar	1.42	— .91	.40	27	12	73.0	8	27.8	20	3	7
„	Aberdeen (Cranford)	1.59	— .55	.42	27	12	73.0	28	30.0	18 ^d	2	...
„	Cawdor (Budgate)	2.38	+ .06	.52	4	18	...	...	...	...	...	...
XVIII.	Strathconan [Beaully]	1.19	— 2.32	.61	25	...	...	...	...	...	...	...
„	Glencarron Lodge	3.90	— 1.84	1.19	30	13	76.4	7, 8	30.9	20	1	...
XIX.	Dunrobin	1.36	— .68	.27	24	12	69.0	4	34.0	20	0	...
„	S. Ronaldshay (Roeberry) ...	...	...	...	...	...	...	...	...	...	...	...
XX.	Darrynane Abbey.....	4.12	+ 1.02	1.70	23	11	...	...	44.0	14	0	...
„	Waterford (Brook Lodge) ...	5.31	+ 2.70	1.89	25	10	73.0	5	35.0	21	0	...
„	Broadford (Hurdlestown) ...	1.33	— 1.08	.36	25	11	70.0	5, 27	38.0	13	0	...
XXI.	Carlow (Browne's Hill)	3.15	+ .88	.86	25	10	...	...	...	...	...	...
„	Dublin (Fitz William Square)	2.49	+ .57	.84	22	13	72.7	28	41.0	14	0	0
XXII.	Ballinasloe	2.04	— .61	1.02	24	13	73.0	7	35.0	20	0	...
„	Clifden (Kylemore)	2.32	— 3.11	.63	23	7	...	...	...	...	...	...
XXIII.	Seaforde	2.97	+ .41	1.34	22	12	86.0	28	35.0	18 ^e	0	1
„	Londonderry (Creggan Res.) ..	.87	— 2.27	.19	22	9	...	...	...	...	...	...
„	Omagh (Edenfel)	1.95	— 1.06	.96	22	12	76.0	7	38.0	19	0	...

+ Shows that the fall was above the average; — that it was below it.

^a and 15. ^b and 29. ^c and 28. ^d and 19. ^e and 20.

SUPPLEMENTARY RAINFALL, JUNE, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	5·41	XI.	Llandefaelog-fach.....	...
II.	Dorking, Abinger Hall ..	5·19	„	New Radnor, Ednol.....	3·69
„	Sheppey, Leysdown	4·75	„	Rhayader, Nantgwillt ...	3·30
„	Hailsham	2·44	„	Lake Vyrnwy	1·30
„	Crowborough.....	4·17	„	Ruthin, Plas Drŵ	1·68
„	Ryde, Beldornie Tower..	2·17	„	Criccieth, Talarvor	1·34
„	Bournemouth, Kempsey ..	2·47	„	I. of Anglesey, Lligwy..	1·78
„	Emsworth, Redlands ...	2·22	„	Douglas, Woodville.....	2·58
„	Alton, Ashdell	4·06	XII.	Stoneykirk, Ardwell Ho.	2·92
„	Newbury, Welford Park ..	6·00	„	Dalry, Old Garroch	3·10
III.	Oxford, Magdalen Coll..	5·66	„	Moniaive, Maxwellton Ho.	2·44
„	Banbury, Bloxham	3·85	„	Lilliesleaf, Riddell	1·48
„	Pitsford, Sedgebrook ...	3·06	XIII.	N. Esk Res. [Penicuik]	2·00
„	Huntingdon, Bampton..	3·60	XIV.	Dalry, Blair	3·21
„	Wisbech, Bank House...	2·02	„	Glasgow, Queen's Park..	1·74
IV.	Southend	5·87	XV.	Inveraray, Newtown ...	2·96
„	Colchester, Lexden	3·16	„	Ballachulish, Ardsheal...	3·87
„	Saffron Waldon, Newport	5·71	„	Campbeltown, Redknowe	1·55
„	Rendlesham Hall	3·41	„	Islay, Eallabus.....	·94
„	Swaffham	2·37	XVI.	Dollar.....	2·76
V.	Salisbury, Alderbury ...	3·28	„	Balquhider, Stronvar...	3·38
„	Bishop's Cannings	4·85	„	Coupar Angus Station...	2·30
„	Ashburton, Druid House	2·70	„	Blair Atholl ...	2·25
„	Okehampton, Oaklands..	2·66	„	Montrose, Sunnyside ...	2·14
„	Hartland Abbey	1·59	XVII.	Alford, Lynturk Manse..	1·86
„	Lynmouth, Rock House	3·03	„	Keith H.R.S.....	1·89
„	Probus, Lamellyn	1·34	XVIII.	Fearn, Lower Pitkerrie..	1·51
„	Wellington, The Avenue	2·81	„	S. Uist, Askernish	1·54
„	North Cadbury Rectory	3·03	„	Invergarry	2·37
VI.	Clifton, Pembroke Road	3·74	„	Aviemore, Alvie Manse.	2·10
„	Ross, The Graig	2·81	„	Loch Ness, Drumnadrochit	1·93
„	Shifnal, Hatton Grange	1·31	XIX.	Invershin	1·45
„	Wem Rectory	1·13	„	Bettyhill	1·79
„	Cheadle, The Heath Ho.	·85	„	Watten H.R.S.....	·91
„	Coventry, Kingswood ...	2·89	XX.	Cork, Wellesley Terrace	3·94
VII.	Market Overton	1·69	„	Killarney, District Asyl.	2·27
„	Grantham, Stainby	1·68	„	Glenam [Clonmel]	2·92
„	Horncastle, Bucknall ...	·88	„	Ballingarry, Hazelfort...	2·05
„	Workop, Hodsck Priory	1·29	„	Miltown Malbay	1·01
VIII.	Neston, Hinderton	1·34	XXI.	Gorey, Courtown House	4·06
„	Southport, Hesketh Park	2·22	„	Moynalty, Westland ...	1·46
„	Chatburn, Middlewood..	2·32	„	Athlone, Twyford	1·75
„	Duddon Val., Seathwaite Vic.	2·96	„	Mullingar, Belvedere ...	1·20
IX.	Langsett Moor, Up. Midhope	1·84	XXII.	Woodlawn	1·36
„	Baldersby	1·71	„	Westport, Murrisk Abbey	·83
„	Scalby, Silverdale	1·75	„	Crossmolina, Enniscoe ..	·94
„	Ingleby Greenhow Vic..	4·14	„	Collooney, Markree Obs.	·70
„	Middleton, Mickleton ...	1·50	XXIII.	Enniskillen, Portora ...	2·35
X.	Beltingham	1·66	„	Warrenpoint.....	2·02
„	Ramburgh	2·35	„	Banbridge, Milltown ...	1·23
„	Keswick, The Bank	1·59	„	Belfast, Springfield ...	2·05
„	Melmerby Rectory	1·33	„	Bushmills, Dundarave..	·72
XI.	Llanfrehfa Grange	2·68	„	Stewartstown	1·64
„	Treherbert, Tyn-y-waun	...	„	Killybegs	1·35
„	Castle Malgwyn	1·90	„	Horn Head	·89

METEOROLOGICAL NOTES ON JUNE, 1903.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

LONDON, CAMDEN SQUARE.—After a brilliant day on the 1st, the temp. suddenly fell and no further warm weather was experienced until almost the end. A period of extraordinary wetness set in on the morning of the 9th, lasting till the night of the 19th, during which time 6·43 in., the whole of the month's R fell. This total has only been exceeded in June, 1878, with 6·71 in., and only on one other occasion in any month—namely, in August, 1878, with 6·72 in. On 13th, 14th, and 15th, the fall exceeded 1·00 in. in 24 hours. The mean temp. was 57°·6, or 2°·8 below the average, and the lowest in 46 years, except 56°·4 in 1860 and 56°·5 in 1871. The shade max. on 19th, 50°·8, was 2°·7 lower than the previous lowest value in June. T, L and H on 16th.

ABINGER HALL.—Fine till 8th and then extremely wet. Several frosts. TS on 16th.

TENTERDEN.—The first week was dry. From 8th to 19th was generally very wet. Cold, except for the first day and the last week, which were dry and hot. Duration of sunshine 195 hours.

CROWBOROUGH.—After the 1st, which was unusually warm, it was cool till 19th, and afterwards warm and dry. In 10 days, from 8th to 19th, 4·17 in. of R fell. On the night of 28th the min. temp. was 62°·9.

HARTLEY WINTNEY.—The greatest R ever recorded in any month, except October, 1891, when 7·07 in. fell. The first fortnight was cold, dull and cloudy; the second hot, dry and sunny.

WINSLOW, ADDINGTON.—The greatest June R ever registered at this station.

NORWICH, BRUNDALL.—A month of extremes. The 28th gave the highest June temp. in 21 years, and the 13th the lowest in the same period. The first 12 and the last 10 days were almost rainless, and nearly the whole month's fall occurred on the 8 days, 13th to 20th. The mean temp. was 2°·4 below the average of 20 years, and lower than any since 1886. L on 16th and 17th.

WINTERBORNE STEEPLTON.—Unusually cold. Mean temp. 53°·6, or 3°·0 below the average of 10 years. The excessive R of London and the Thames Valley did not extend to this part, and the R was less than the average.

TORQUAY, CARY GREEN.—R 3·4 in. below the average. Duration of sunshine 215·9 hours, or 15·8 hours below the average. Mean temp. 56°·6, being 2°·2 below the average. Mean amount of ozone, 5·0; max. 8·0 on 22nd with S.E. wind, min. 3·0 on 5th with S.S.E. wind.

WELLINGTON.—Fine and warm at first. Weather changed on 8th, becoming very wet and at times abnormally cold till the 20th, when it improved. R about 75 in. above the normal.

NORTH CADBURY RECTORY.—The first week and the last 10 days were fine and dry. From 8th to 20th was very gloomy with much R, though little compared with what fell round London. The 14th was the coldest June day by 8° in 7 years, and less warm than April 13th when there was 8. Big H stones on 17th.

CLIFTON, PEMBROKE ROAD.—The first week was fine and warm, with high bar. and E. winds; from 8th to 16th very wet and cold, with R all day on 14th and 15th, the coldest days in June for 50 years. The last week was fine and warm with rising bar. R 1·40 in. above the average. TSS on 9th and 13th.

BOLTON, THE PARK.—During the first 20 days there were 19 on which the wind was E. or N.; this kept the temp. below its normal value, the lowest temp. in the screen being 35° and on grass 27°. Very little R fell until 24th and the three following days. The mean temp. was 53°·5, or 2°·5 below the average. Duration of sunshine 133 hrs. 20 mins.

SEATHWAITE VICARAGE.—A dry month, with persistently low night temp. and bright sunny days.

HULL, PEARSON PARK.—The earlier days were frequently cold, with N.E. wind and low night temp. Heavy R on 13th, 15th and 17th. T and H on 25th.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Cold and ungenial after a hot week at the end of May. Fruit was much blighted by cold wind; the hay crop was very short and vegetation much retarded.

HAVERFORDWEST.—Unusually cold and inclement, with strong and persistent N. and E. winds throughout, reaching the force of a gale on the 1st and 2nd. Crops very backward and hay crop thin. Duration of sunshine 147·6 hours; three sunless days.

ABERYSTWICH, GOGERDDAN.—Very ungenial throughout, with heavy E and cold winds. Good weather in the last week, but too cold at night.

SCOTLAND.

CARGEN [DUMFRIES].—The dry weather of the first three weeks, accompanied by E. winds, most adversely affected the hay, corn and turnip crops.

INVERARAY, NEWTOWN.—Very fine and dry for the greater part of the month, but not warm, except for a few days at the beginning.

ISLAY, EALLABUS.—R only about one-third of the average.

MULL, QUINISH.—Absolute drought for 17 days from 5th to 21st, with brilliant sunshine. The first week of the drought was very hot and calm, but afterwards wind went to N. and E., with very cold nights. Sharp frost on 19th and 20th did much damage. This was the first frost in June since observations started 30 years ago. T and L on 29th.

COUPAR ANGUS.—The mean temp., 54°·7, was practically the average, but the extremes of 82° on 4th and 29° on 14th were unusual, and potatoes and the young leafage of the beech suffered much. Ground frosts occurred on 3 nights. R 58 in. in excess of the average.

ALFORD, LINTURK MANSE.—Notable for continuance of drought, the R being little felt till 19th and the ground fairly moistened only on 27th.

IRELAND.

CORK, WELLESLEY TERRACE.—R 1·15 in. over the average, and for the first 6 months of the year 7·50 in. over the average. The coldest June for 21 years except 1902; min. temp. on 14th, 34°·5, the lowest in June for 21 years.

DARRYNANE ABBEY.—Very dry to 20th, the fall being only 11 in. on 3 days, followed by 3·72 in. on 5 days.

WATERFORD, BROOK LODGE.—The wettest June since 1879. T on 24th.

BROADFORD, HURDLESTOWN.—From May 17th to June 16th only 1·02 in. of R fell on 8 days, 83 in. falling in a TS on May 29th, during which 80 in. fell in 20 minutes.

MILTOWN MALBAY.—Cold and very dry. From May 22nd until June 21st there was only 11 in. of R, falling mostly in amounts of 01 in. The June frosts did serious damage to the potato crop in low-lying bogs and bottoms, the cold black drought wilting and stunting all vegetation. All crag and stony lands were burned brown and water running scarce.

DUBLIN, FITZWILLIAM SQUARE.—Between 8th and 19th, rendered memorable by the torrential R in the south of England, only 33 in. fell in Dublin, whilst in the week ending on 27th the fall amounted to 2·16 in. As in June, 1902, winds from Polar quarters prevailed throughout the greater part, but during the last 10 days S. winds were observed. Duration of sunshine 167·5 hours. Mean temp. 56°·4, or 1°·6 below the average. High winds were noted on 6 days, never reaching the force of a gale. L on 28th, and TSS on 14th, 24th and 28th.

BALLINASLOE.—Potatoes were damaged by frost on 20th. During a TS on 24th 90 in. of R fell in an hour.

MARKREE OBSERVATORY.—Very fine and dry almost throughout. Severe frost on the night of the 20th. TS on 24th.

OMAGH, EDENFEL.—A favourable month, more than redressing the ill effects of the earlier months. During the first three weeks the weather was almost continuously fine, with occasional high temperatures, so that the heavy R of the last eight days was needed and welcome.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1903.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	53·8	5	22·1	16	45·2	36·0	38·1	90	78·7	17·3	2·15	17	6·0
Malta.....	66·2	12	45·3	31	59·7	49·9	49·9	80	111·1	39·2	4·14	7	5·1
Lagos, W. Africa	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	91·7	7	51·1	26	76·0	59·0	55·0	64	...	...	1·81	8	3·0
Durban, Natal	95·0	28	61·4	15	86·5	69·0	...	...	152·3	...	2·44	18	6·2
Mauritius.....	89·0	10	66·6	1	86·0	73·4	72·3	80	160·0	63·4	9·26	18	7·1
Calcutta.....	84·1	26	48·9	1	77·9	57·7	56·8	69	135·1	42·7	·21	1	3·5
Bombay.....	86·6	7	61·5	27	81·7	67·8	63·2	69	133·5	52·7	·00	0	2·4
Madras	87·3	2	66·9	1	84·2	69·9	69·8	82	136·0	63·8	4·53	3	3·3
Kodaikanal	71·1	18	43·5	25	64·0	47·6	44·4	71	130·5	28·7	1·25	3	3·8
Colombo, Ceylon.....	92·8	24	73·0	7	89·2	74·1	72·3	80	155·0	71·0	4·16	9	5·3
Hongkong.....	73·8	26	46·2	10	63·0	54·2	48·0	68	123·5	...	1·37	8	7·3
Melbourne.....	105·0	31	48·8	22	77·3	55·5	50·9	63	162·0	40·2	·94	4	4·7
Adelaide	102·3	31	51·9	14	84·1	60·6	50·8	47	159·0	47·0	·87	5	3·0
Coolgardie	113·4	27	49·2	21	96·2	64·4	48·5	33	173·6	47·0	·24	3	1·9
Sydney	89·1	6	57·3	15	77·3	64·6	59·6	65	132·7	49·9	2·28	14	4·4
Wellington	78·5	25	42·0	30	66·7	52·5	48·7	66	132·0	32·0	3·36	18	5·7
Auckland	76·5	7	52·0	30	68·9	57·2	50·3	63	145·0	50·0	7·13	19	5·4
Jamaica, Negril Point..	87·9	13	62·2	18	84·0	69·5	69·2	78	...	...	1·13	5	...
Trinidad	90·0	19	61·0	16	86·9	67·5	69·8	78	160·0	60·0	1·51	3	...
Grenada.....	86·2	9	70·2	26	82·3	72·5	68·7	72	151·0	...	5·09	21	2·8
Toronto	43·9	30	—4·9	9	29·8	16·3	21·4	84	54·0	—9·1	2·70	18	7·8
Fredericton, N.B.	45·9	22	19·5	11	26·8	3·7	4·7	61	...	...	3·96	10	6·0
Winnipeg	35·0	25	—28·7	30	13·6	—9·1	...	...	...	...	·28	3	5·5
Victoria, B.C.	54·0	3	30·3	28	45·2	38·6	...	...	...	...	3·94	20	8·3
Dawson	14·2	13	—60·8	26	—19·6	—33·5	...	...	...	...	·50	2	4·5

MALTA.—Mean temp. of air 54°·3, or 1°·1, above average. Mean hourly velocity of wind 8·4 miles, or 2·9 below average. Mean temp. of sea 60°·2.

MAURITIUS.—Mean dew point 2°·0 above, and R 2·03 in., above average. Mean hourly velocity of wind 8·4 miles, or 2·7 below average; prevailing direction E. by S.

MADRAS.—Bright sunshine 185·2 hours, or 52·4 per cent. of the possible maximum.

KODAIKANAL.—Mean temp. of air 54°·0. Mean daily velocity of wind 287 miles. Bright sunshine 203·0 hours.

COLOMBO.—Mean temp. of air 80°·7, or 1°·6 above, of dew point 2°·4 above, and R ·65 in. above, averages. Mean hourly velocity of wind 7·9 miles.

HONGKONG.—Mean temp. of air 58°·3. Bright sunshine 107·3 hours. Mean hourly velocity of wind 11·8 miles; prevailing direction E.N.E.

ADELAIDE.—Mean temp. of air 72°·4, or 1°·7 above average.

WELLINGTON.—Mean temp. of air 1°·5 below, and R 1·45 in. above, averages.

AUCKLAND.—Unprecedentedly cool and wet, R being the largest yet recorded for the month, and nearly three times the average. Mean temp. 4° below average.

TRINIDAD.—R 1·45 in. below the 40 years' average.